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$\therefore \theta = 67^\circ 43'$ nearly. $AB = 2r \sec \theta = 791.16$ feet.
 $LK = 2r(\sec \theta - 1) = 491.16$ feet.

Also solved by *J. SCHEFFER*.

CALCULUS.

119. Proposed by JOHN M. COLAW, A. M., Monterey, Va.

Rectify the Folium of Descartes, the equation of which is $x^3 + y^3 + 3axy = 0$.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Substitute $-\frac{1}{\sqrt{2}}(x+y)$ and $-\frac{1}{\sqrt{2}}(x-y)$ for x and y , respectively, (revolving the axis through 135°) and the equation becomes

$$3y^2(a\sqrt{2} + 2x) = x^2(3a\sqrt{2} - 2x) \text{ or } 3y^2(a + x\sqrt{2}) = x^2(3a - x\sqrt{2}).$$

$$\therefore y = \pm \frac{x\sqrt{(3a - x\sqrt{2})}}{\sqrt{[3(a + x\sqrt{2})^3(3a - x\sqrt{2})]}}.$$

$$\frac{dy}{dx} = \frac{3a^2 - 2x^2}{\sqrt{[3(a + x\sqrt{2})^3(3a - x\sqrt{2})]}}.$$

$$\frac{ds}{dx} = \frac{\sqrt{[2(9a^4 + 12a^3x\sqrt{2} + 12a^2x^2 - 4x^4)]}}{(a + x\sqrt{2})\sqrt{[3(a + x\sqrt{2})(3a - x\sqrt{2})]}}.$$

Let $a - x\sqrt{2} = 2a \sin \theta$.

$$\therefore S = -\frac{a}{\sqrt{6}} \int \frac{\sqrt{(13 - 20\sin \theta + 16\sin^3 \theta - 8\sin^4 \theta)}}{1 - \sin \theta} d\theta.$$

$$\text{For the loop, } S = \frac{2a}{\sqrt{6}} \int_{-\frac{1}{2}\pi}^{\frac{1}{2}\pi} \frac{\sqrt{(13 - 20\sin \theta + 16\sin^3 \theta - 8\sin^4 \theta)}}{1 - \sin \theta} d\theta.$$

Also solved by *ELMER SCHUYLER*.

120. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

The axis of a paraboloid of revolution coincides with the generating line of a cylinder; the diameter of a cylinder and the latus-rectum of the parabola are each equal to the common altitude, a . Find the surface and volume of each part into which the paraboloid is divided by the cylinder.

Solution by the PROPOSER.

$x^2 + y^2 = az$ is the equation to the paraboloid.

Volume of paraboloid = $v_1 = \frac{1}{2}\pi a^3$.

Surface of paraboloid = $s_1 = \frac{1}{2}\pi a^2(5\sqrt{5} - 1)$.